Energy Training for Construction Workers for Low Energy Buildings

BUILD Up Skills QualiBuild

Report Title: Foundation Energy Skills Programme – General Principles Document

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# Table of Contents

## Contents

Table of Contents ........................................................................................................... 3

1 \ Executive Summary ..................................................................................................... 4

2 \ Introduction .................................................................................................................... 5

3 \ Analysis of Relevant Sources ....................................................................................... 6

3.1 \ BUSI Status Quo Report Analysis ............................................................................. 6

3.2 \ Indicative Content ....................................................................................................... 9

3.3 \ BUILD Up Skills Roadmaps and Pillar II projects .................................................. 10

3.4 \ National Training Programmes ................................................................................. 11

\[3.4.1 \text{ Building Energy Rating Training} \] ................................................................ 11

\[3.4.2 \text{ SafePass} \] ......................................................................................................... 11

\[3.4.3 \text{ Other relevant training} \] .................................................................................. 11

3.5 \ BUSI Roadmap Consultation .................................................................................... 12

\[3.5.1 \text{ TRAINING} \] ....................................................................................................... 12

4 \ General Principles ........................................................................................................ 16

4.1 \ Scope .......................................................................................................................... 16

4.2 \ Target Audience ........................................................................................................ 16

4.3 \ Entry Requirements ................................................................................................... 16

4.4 \ Learning Content ....................................................................................................... 16

4.5 \ Learning Units ............................................................................................................ 18

4.6 \ Assessment ............................................................................................................... 18

5 \ Appendices .................................................................................................................. 19
1 Executive Summary

This report sets out the general principles which will be guide the development of the Foundation Energy Skills training programme.

There are some opportunities to build on experience, and potentially utilise content, from previous training programmes. However, it has to be noted that many of these have been focused on Level 6 education and higher.

There exists potential for Ireland to cooperate with other the implementation of roadmaps in other EU Countries – in particular Sweden and Slovakia. Specific efforts should be made to engage with these countries to explore opportunities for exchange of content and learnings.

The principles outlined in the Irish Status Quo report and roadmap remain valid and will continue to guide the development of the programme content. These have been reviewed by project partners and have also been discussed with the projects Steering Committee in principle.
2 Introduction

This document seeks to review the considerations given to the development of a Foundation Energy Skills programme as part of the BUILD UP Skills Ireland (BUSI) Roadmap. The document outlines the proposals within the Roadmap itself, the issues which need to be considered arising from the BUSI consultation process and links with other BUILD Up Skills initiatives in other countries.

The final section of the document details the guiding principles which should determine the development and delivery of the programme.
3 Analysis of Relevant Sources

3.1 BUSI Status Quo Report Analysis

The Status Quo report, and some of its earlier drafts, were reviewed to extract specific and relevant data and content which will guide the development of the Foundation Energy Skills programme.

The Executive Summary of the final report sets the framework for development of the programme:

“Generally in the building sector, the gap that exists is one of knowledge rather than skills.

However, this knowledge is fundamental for the successful implementation of low energy buildings. It is important to understand the mind set of workers who, based on their years of experience, believe that they already know the ‘right way’ to do their job. The science that underpins energy efficient building should be presented and demonstrated in a format that is familiar to construction workers, in order to foster a change in attitude and enable acceptance of the necessity for a new approach to their work.

The tiered model of up-skilling is designed to provide the foundation skills and knowledge with clearly defined progression pathways to more advanced specialist training where appropriate to workers’ roles …..

This report has identified the importance of a homogeneous approach to on-site implementation of low energy construction/renovation. Maintaining insulation and airtight fabric envelopes, while integrating mechanical and electrical installations will require a common knowledge base and understanding of individual responsibilities among all those involved in the process. At operative and craft level, all workers involved in building construction and renovation will require training.”

BUSI Status Quo Report, Page 3.

The relevant components of a building were reviewed to determine the skills needs for the relevant crafts. The following extracts are relevant in the context of the FES programme

Section 7.2.2 Building Fabric Page 96.

“The core skills required to implement energy saving technologies for building fabric already exist onsite. The ability to dimension, cut, shape, position, fix and seal fabric elements are part of the traditional skill set of operatives and craft workers. The gap that exists is one of knowledge. Those involved in construction and renovation are generally unaware of the underpinning principles for low energy building. These may apply to all elements of the building envelope and include: Modes of heat transfer; Air infiltration and air tightness; Properties, selection & positioning of insulation materials; Selection & positioning of building membranes; Continuity of insulation layers; Thermal bridging; Ventilation, vapour control & condensation.”
FES General Principles

Section 7.2.2 Ventilation; Page 97

Building regulations are the main driving force behind the adoption of new ventilation technologies (see: Error! Reference source not found.). The adoption of a nearly zero energy building framework for building standards in Ireland will inevitably lead to a greater market penetration for systems other than the traditional natural ventilation from background ventilators (see: ). Installers of these systems will require a range of knowledge and skills pertaining to:

- **Building regulations for ventilation**
- **Air infiltration and air tightness**
  - Analysis of ventilation rates
  - Design and selection of ventilation systems
  - Location and maintenance of mechanical units
  - Fire safety regulations
  - Controls for mechanical ventilation systems
  - Ventilation requirements for combustion appliances
- **System efficiency**
  - Heat recovery
  - Ducting (i.e., positioning, insulating, jointing, sealing and moisture control).
### Section 7.2.4 Heating

On-the-job training is generally limited by the specialisation of workers in industrial/commercial, domestic or maintenance sectors which is restricting the opportunities for craft workers to practice skills in real work situations. **Generally, more knowledge and technology awareness of the factors affecting energy use in buildings, installations, and system efficiency enhancement is required.**

<table>
<thead>
<tr>
<th>Building Element</th>
<th>Knowledge/ Skills Need</th>
<th>ISCO 7126 Plumbers and pipe fitters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space Heating/ Cooling, Water Heating and Controls</strong></td>
<td>Modes of heat transfer</td>
<td>9,000</td>
</tr>
<tr>
<td></td>
<td>Distribution and storage losses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficiency of appliances</td>
<td></td>
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<td></td>
<td>Hydraulic balancing</td>
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<tr>
<td></td>
<td>Integration of systems</td>
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<tr>
<td></td>
<td>Heating Controls</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ventilation &amp; condensation</td>
<td></td>
</tr>
</tbody>
</table>

The onus for the efficient operation of domestic heating systems lies with the installer/contractor. However, existing training programmes are generally single technology specific, e.g. gas installation, oil installation, solar thermal, biomass, heat pump. **In most cases, the training fails to provide the multi-disciplinary skills that may be required to design and integrate multiple systems.** These are skills and competences that domestic heating contractors and supervisors need to effectively participate in and oversee works.

<table>
<thead>
<tr>
<th>Building Element</th>
<th>Knowledge/ Skills Need</th>
<th>ISCO 7126 Plumbers and pipe fitters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domestic Heating Installation</strong></td>
<td>System design&lt;br&gt;Properties, selection &amp; installation of insulation for primary and distribution pipework and storage vessels&lt;br&gt;Hydraulics &amp; fluid mechanics&lt;br&gt;Heat loss calculations&lt;br&gt;Heating control system design and installation</td>
<td>1,350</td>
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### Ventilation

<table>
<thead>
<tr>
<th>Ventilation</th>
<th>electricians</th>
<th>refrigeration craft workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air tightness/ Air infiltration</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>Ventilation</td>
<td></td>
<td>100</td>
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<tr>
<td>System Design</td>
<td></td>
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<td>System Efficiency</td>
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<td>Controls</td>
<td></td>
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<tr>
<td>Building Regulations</td>
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</tbody>
</table>
3.2 Indicative Content

Version 2.0 of the Status Quo report included specific detail on what may be included in the Foundation Skills (called Stage 1 in this version of the report). This combines the various issues and knowledge gaps which were identified across the various components/crafts.

Section 7.3 – Qualification Needs

The change in approach to building for enhancement of energy performance requires integrated effort and approach by all crafts involved in the construction/renovation process. Therefore, there are underpinning knowledge and skills needs for all crafts to facilitate a coordinated approach to the achievement of any active energy performance standards. It is envisaged that this will require a training programme of sufficient duration to allow for adequate assessment of learning outcomes and could be delivered as a daytime or part-time evening/weekend programme for those in employment (Stage 1 and 2 training combined to 5 ECTS credits in total). There is an advantage to delivering this training to groups from mixed trades in the possibilities for discussion and exchange of learning within the class. Such an approach also provides an opportunity to clarify the responsibilities of each craft and provide real examples of the consequences of a lack of coordination.

Stage 1 - Be able to demonstrate common knowledge and skills base for all crafts involved in the construction/renovation process, including the importance of team working and coordination on site.

The indicative training will be developed at NFQ Level 6 Award, i.e., the same level as existing craft qualification in Ireland. The indicative content of the programme will cover:


Stage 2 - Be able to demonstrate the application of underpinning knowledge and skills gained from Stage 1 to specialist areas of each craft as may be necessary.

3.3 BUILD Up Skills Roadmaps and Pillar II projects

A review of the action plans developed by the 31 countries involved in the BUILD Up Skills Initiative was completed to identified countries who were also considering the development of similar Foundation Skills programmes. Of the 31 Roadmaps reviewed 8 had references to programmes which were similar in nature to that proposed in Ireland. Of these 8 the following are of particular interest

- Slovenia: Has proposed the development of an Energy Principles module (Appendix 1) which gives guidance of potential content for the Foundation Skills module.
- Spain: Has a proposed action on the development of training content on Energy Efficiency in Buildings (Appendix 1)
- Sweden: Has a Foundation Energy training module proposed which should be offered to all workers in the building sector.
- UK: Proposed to establish an Energy Principles Unit which would develop training content.

There is clear opportunity for cooperation with Slovenia and Sweden to determine if there are possibilities for sharing of content and training resources.

A review of the Build Up Skills projects funded under Pillar II (April 2013) call indicates that the majority of projects are focused on specific skills training, rather than a broad knowledge based approach e.g.

- Spain: Specific training on heating systems and insulation
- Romania: Training for insulation and window installers
- Latvia: Training on heating and insulation
- Cyprus: Training on insulation and thermopanes/sunshades

Austria presents an opportunity for engagement as they are developing “A Basic cross-craft training module” and “A Passive House Craftsmen course light”.

Germany has a work package focused on Cross-Trade CVET programme which aims to integrate ‘interfaces between trades’ and ‘the building as an integrated system’.

Finland aims to complete the majority of its training on-site and in environments allowing practical exercises, but this is particularly focused on so called ‘change agents’ which are equivalent to supervisors in the Irish context.

The Netherlands has a particular focus on cross-trade/inter disciplinary training
It is recommended that in January 2014 contact is made with all of the Pillar II projects to consider future cooperation/exchange as necessary.

In conclusion, the initial focus in terms of potential for linkages will be with Slovenia, Sweden and Austria with a view to maximise the resources applied to the implementation of the FES programme.

3.4 National Training Programmes

3.4.1 Building Energy Rating Training
The BER training programme is delivered by SEAI approved training providers. It is aimed at professionals with relevant qualifications (engineers, architects, quantity surveyors etc.) and therefore has a high theory content. The objective of the programme is to ensure that trainees can implemented building energy rating assessments under the SI 666 which transposed the EPBD into Irish legislation.

The content of the training programme is focused particularly on the use of the Dwelling Energy Assessment Procedure (DEAP) software but some of the content in Unit 1 (BER in Ireland) presents opportunities for integration into the FES Programme. Care will have to be taken in translating this information as the BER training is not aimed at crafts workers but at professionals with a minimum of a L7 award.

3.4.2 SafePass
While SafePass is not specifically an energy programme the principles of the all workers completing a standard programme to raise knowledge in a particular area to a common level is at the core of the programme.

It is a 1-2 day programme delivered a low cost (€100-150 per participant) and training also typically has different crafts/occupations within one training group. The content delivery is particularly theory based and is normally delivered by a private training provider or approved public body. It has a wide spread awareness and knowledge across the sector and amongst consumers also. However, there is no formative assessment at the end of the training and no entry requirements.

3.4.3 Other relevant training
- TrainEnergy
  - This was an EU funding programme which developed a range of training content for construction workers. A number of training courses were delivered throughout Europe. The training content is available for use and amendment as appropriate.
- CEBSEM
  - This is a Leonardo di Vinci funded programme coordinated by Limerick Institute of Technology. Participants attend a 2 week training programme in Germany with the primary focus being on low energy timber frame construction
- HEATPlus
  - This is a Leonardo di Vinci funded programme coordinated by Limerick Institute of Technology. Participants attend a 2 week training programme in Germany with the primary focus being on sustainable heating systems
- Passiv House Craftsperson
FAS run a specific Passiv House training programme. This has a dedicated training centre and lessons can be learned in the context of some of the technical demonstration of particular components

- SustainCo
  - The SustainCo project is focused on Near Zero Energy Buildings and has develop Technical and Financial Toolkits. ([http://www.sustainco.info/ie/toolkits/](http://www.sustainco.info/ie/toolkits/)) and is due to deliver training to professionals in 2014. This provides the opportunity to link to progression content for FES participants.

- Low Carbon learning Zone
  - This is a dedicated website which provides a comprehensive insight into specific topics of Air Tightness, Thermal Bridging and Thermal Design. [http://www.leedsmet.ac.uk/teaching/vsite/low_carbon_housing/about.htm](http://www.leedsmet.ac.uk/teaching/vsite/low_carbon_housing/about.htm)

### 3.5 BUSI Roadmap Consultation

The BUSI Roadmap held a number of consultation workshops throughout Ireland which gathered a range views in relation to the implementation of the roadmap. The key issues raised have been grouped under relevant headings:

#### 3.5.1 Training

- There is a lack of integrated craft training within one trade, for example basic plumbing followed by advanced training on ex. heat pumps.
- There is a lack of cross-trade training that would facilitate collaboration between trades on site, for example at the moment plumber puts in a heat pump, but electrician cannot set-up controls.
- Some of the new courses, for example GSD, cover only parts of the relevant material.
- It is important to train general operatives so they have an appreciation of the various trade interactions. General operative training should extend to suppliers and delivery companies where products may be damaged before delivery to site.
- There has been an increase in the private training companies providing courses for unemployed; however, the perception amongst the workshop participants was that the quality of that training was poorer in comparison to main stream training programmes. The training offered by suppliers was deemed of higher quality.
- There have been many training programmes available over the last few years; however, there are many barriers for the training uptake: high cost of training, funding is mainly addressed at the unemployed workers, and there is not enough money earned from the jobs to pay for training. At the same time there are very few incentives to take up training.
- Collaboration between trades is required in order to ensure that the key requirements for low energy buildings, such as air-tightness, are implemented.
- The building regulations need to be made part of the education process and any changes in the regulations should be directly accommodated into the courses provided.
- Systems thinking should be thought at all levels.

#### 3.5.1.1 Content Specific Training

Participants were asked the following questions in the context of three skills areas (Building Fabric, Building Services and Site Management):

- What should be the scope, content and learning outcomes of training programmes aiming to bridge the knowledge, skills and attitude gaps in relation to energy in buildings?
- How should such training programmes be delivered in order to develop a multidisciplinary skills and knowledge and foster attitudinal change?

The main issues that have arisen during discussions are presented below.
3.5.1.1 Building Fabric

- General principles and basic building science.
- Impact of different types of construction methods for building energy efficiency.
- The impacts and consequences of one trade's work on site for other trades.
- Knowledge of basic fabric and structure.
- Terminology for effective communication between trades and professionals.
- Knowledge of key issues for low energy buildings, such as airtightness, movement of moisture/condensation, ventilation, insulation, U-values, thermal bridging.
- Changes in building regulations and how to implement the new standards in the construction process.
- Knowledge of building materials and construction methods.
- Use of case studies to illustrate good practice.
- Leadership and ethics.

Learning Outcomes

- Learning outcomes should be divided in regard to three categories: need to know, nice to know and if there was time to cover it.
- Upon the completion of training, crafts should be able to answer the following questions:
  - What is low energy?
  - Where the building details go wrong? And what is the good practice to prevent that?
  - How to apply building physics for low energy construction?
  - How their work affects the work of other trades and vice versa?
- Attendees need to become more reflective about the consequences of their actions.

Learning Modes/Aids & Training Delivery

- There is a need for a practical guidance that could be delivered in the form of a manual.
- Course should be a mixture of theory in classroom and practical demonstrations in the workshops.
- New technologies can be used for the delivery of training, such as DVDs or online tutorials.
- The courses should be delivered to groups of mixed trades, however, relevance to different trades should be emphasised.
- Standardised examples of poor and good practice relevant for different trades should be used across the country.
- Concerns were raised that training may not be effective if there are no opportunities to practice new knowledge and skills in work situations.

Logistics Of Programmes Delivery

- Training courses should be made available at local and regional level.
- For crafts in employment training could be provided in the workplace.
- There would be a need to repeat/refresh the course on regular basis, especially since building regulations are being changed at regular intervals.

Other Issues

- Concerns were raised that it would be difficult to provide practical guidance for retrofitting projects as these are very diverse in nature.
- Quality, content and learning outcomes need to be standardised across all courses.
- Participants suggested that word “green” should not be part of courses as it may have unwanted associations.
Participants emphasised that attitude is a big part of getting the work on building fabric right in low energy buildings; therefore training should also address the culture and attitude gap.

Knowledge of materials and how they fit together is also very important.

3.5.1.1.2 Building Services

Scope & Content

The basic training content for the trades in building services should be similar to the content for the building fabric trades. It should focus on knowledge development rather than skills. However, there should be also additional training specific for building services, for example on how to run pipework/cables around joist to maintain air-tightness etc.

Building information modelling and ability to use new technologies for that purpose.

Fire proofing should also be part of the training.

Boilers and heating controls.

Knowledge on how energy is used and lost in a building.

Other areas that should also be covered include internal environment and occupants’ health.

Learning Modes/Aids & Training Delivery

Similarly like in the case of building fabric, training should be provided to the mixed trades groups, with good balance between practical and theoretical elements.

Logistics Of Programmes Delivery

Similar issues to those listed for training delivery for building fabric crafts were discussed, including the use of video and online training, possibility of distance training and mixture of classroom and workshop based training.

If majority of training was to be delivered long-distance, for example, online, such training should start and end with a residential day.

Feedback from attendees should be collected and used to improve courses.

Training programmes should be delivered locally to reduce associated costs for trainees, such as transport and accommodation.

Training programmes should be delivered in the evening and at weekends to avoid losing work time.

The foundation courses would be well spread geographically, while Tier 2 courses can be offered in more specialised centres.

Online training, although considered a good option, had some drawbacks, such familiarity of trainees with computers and no opportunity for debates and conversations that normally takes place in the classroom.

Other Issues

Before people embark on training courses their skills, knowledge and practical experience should be assessed to ensure that people in one group are trained up to the same level.

The training message should say “you have been doing things well, but now we need to change how we do things overall”.

Training Delivery

Institutes of Technology have the required skills, knowledge and facilities to deliver the training.

The training needs to be affordable and delivered locally.

The online delivery of training is better suited for the site managers than the crafts.
The foundation training could be delivered by all Institutes of Technology and the higher levels of training by Institutes specialising in craft specific courses.

Potential to use mobile labs for the Tier 1 training.

The existing resources and facilities should be used to deliver the training.

The programmes should be delivered by tradesmen rather than professionals to create better rapport between the trainees and the trainer.

On-site training was considered difficult and having potential health and safety issues.

Once the training has been delivered feedback from the employer should be requested to assess whether employees knowledge increased, what impact it had on productivity, attitude and skills.
4 General Principles

The following seeks to set out the general scope, learning levels and learning outcomes of the programme

4.1 Scope

This programme will

- educate learners about the principles of low energy building and how these principles are applied on-site for new build and retrofit scenarios
- be focused on illustrating how low energy buildings can be achieved in practice
- be of an appropriate duration to ensure maximum participation is balanced against covering appropriate level of content
- involve group discussion/exercises/activities to maximise cross-trade/craft knowledge transfer
- not provide detailed installation instructions for products, systems or technologies
- not lead to a qualification which allows successful learners to register on specific schemes for product/system/technology installation e.g. National Retrofitting support schemes
- result in a qualification and award under the National Framework of Qualifications

4.2 Target Audience

The target audience for the programme is

- General operatives: those construction workers who have no specific craft qualification but contribute to the construction industry e.g. labourers, glazers, steel fixers etc
- Craft Apprentices: apprentices who have started their apprenticeship and typically are at Stage 4 or later in their apprenticeship
- Craft Workers: those who have completed their apprenticeship and may or may not have a period of post apprenticeship work experience completed.

There should be no distinction made between those who are unemployed or employed initially. However, it should be noted that the priority in the short term is to roll out the training to those who are currently employed in the sector.

4.3 Entry Requirements

The target audience indicates that the entry requirements will have to be at a level which does not exclude general operatives from engaging in the programme. It is proposed that an entry requirement of Level 3 on the National Framework of Qualifications might be appropriate to consider.

An alternative is to set no minimum entry requirement.

Those who have a relevant award at Level 6/7/8 in engineering, architecture, construction studies etc. should be excluded from taking the programme as the primary focus is on construction workers and crafts.

4.4 Learning Content

From reviewing the various sources and related documentation the following is proposed in terms of content. Some comments on how this content may be delivered are also made. The SustainCo project might be considered as a model for the structuring of the content – it has also included some graphical aspects to link the components which may be of relevance.
- Definitions: Green Building, NZEB, Low Energy etc
  - Potential for some group work/cross trade discussion on the use of terminology could be good at the start of the training programme

- Regulations and Rules: EPBD, Building Control Act, Building Regulations, Local Building Laws
  - This should be delivered in a manner which tries to overcome the ‘dryness’ of the material. Perhaps taking it as a ‘story’ from Roger the Regulator who travels from Brussels to Borrisoleigh and tells the story of building regulations and why they are needed. Potential for some multi-media content

- Buildings as a System: Integrated Approaches, Cross Trade impacts, Systems Thinking.
  - The concept of systems thinking needs to be introduced into the programme at an early stage. This should set the scene and be a reference point throughout the programme. This could be achieved through the development of Systems Thinking quizzes within the relevant units.

- Energy Principles: Units of Energy, Energy Stats for buildings; Key terms
  - Use of some of SEAI Primary School activities/experiments to explain concepts.

- Heat Transfer: Modes of heat transfer including conduction, convection, radiation and where they occur in buildings. Laws of thermodynamics. Effects of thermal mass and solar gain. Insulation methods and materials
  - To be delivered using graphics and images. No equations!
  - Lots of samples and examples of insulation materials

- Thermal Bridging, definition and identification. Effect of thermal bridging on heat loss and condensation. Repeated thermal bridging, thermal bridging due to penetrations in the building fabric.
  - To be delivered using graphics and images. No equations!
  - Sample junctions etc. which are available and mobile are needed

  - This is a large and interrelated area which needs to be carefully considered in terms of delivery. An approach of using ‘characters’ to explain the concept may be worth considering.
  - Approach should be also on answer the questions of Why Air Tight; Why Ventilation, Why Control and also on debunking the myths that exist e.g. My Granny never got sick and she lived etc.
  - Lots of cross trade discussion/examples/engagement needed
  - Some content on health benefits also needed

- Energy use in buildings: Factors affecting energy use for space/hot water heating. Energy use for pumps, fans and lighting. Matching supply and demand
  - Needs to consider some design components/aspects as this will engage the electricians, plumbers a little
  - Cross trade consideration need along with links to air-tightness

- Low Energy Language: What the customer says/wants; What the Designer/Architect/Engineer says/wants; What the Specification says; What the Building Control Officer/Supervisor says/wants
  - The final session should focus on the building up of a common understanding of what different languages are used across/along the construction chain
  - Should also provide participants with some questions which they can ask if they don’t understand what is being asked of them
4.5 Learning Units

The content should be development so that it is available in distinct learning units. Each learning unit may have individual learning objects associated with that unit. Each learning unit should have

- A Unit Learning Outcome
- A Connection activity – engage the learners in the particular topic within the unit
- A Content activity – provision of learning content
- A Practice activity – applying that content to a particular issue
- A Summary activity – an activity which summarises the content of the Unit and confirms achievement of the Learning Outcome.

Each learning unit should be designed to be part of the suite of units combined to achieve the programme learning outcomes. Some of the units may be considered for use as stand alone its.

One learning unit could be developed which is a site visit. This could be developed as an optional unit for use if the delivery of the programme at the particular time/place facilitates this. It could be used to reinforce learning content from the other units but not be a requirement.

4.6 Assessment

Assessment should be completed through a series of question banks at the end of each topic. This could include multiple choice, descriptive, selective and other question types. Consideration should be given to the following aspects also

- Participants be required to submit a minimum of 5 questions/queries they have about low energy building before the programme
- Participants to complete an on-line case study in addition to the question banks
- Assessment to be done after the training and not during it
- Marks to be given for attendance ~ 20%
- Inclusion of practical assessments will be very difficult given time, health and safety and resources restrictions
5 Appendices

Extract from Swedish Roadmap

1.20 A Basic supplementary training course on energy-efficient construction should be designed in order to create a basic understanding of energy-efficient construction. Supplementary training should be possible to sub-order as required and be carried out in different ways by different operators. Instructors may thus be available in construction and installation companies and at training providers. Supplementary training must combine theoretical and practical information. Training material must be created and made freely available to all trainers. The stakeholder group should also be responsible for the administration and development of training. (Stakeholders: Construction material industries, EIO - The Association for Swedish Electrical Contractors, Swedish Energy Agency, Passive House Centre, SP, Swedish Construction Federation, Swedish Association of Plumbing and HVAC Contractors)

Extract from Slovenia Roadmap

4.3.1 Module #1 – BASIC KNOWLEDGE

Basic knowledge concerning new construction and comprehensive renovation according to nZEB are covered in Module #1. Permanent education and programs training basic knowledge will be prepared and implemented in such a way, that participants will gain the next set of key compencies:

- understanding of the meaning of low energy construction,
- understanding of the meaning of an interdisciplinary approach for the effectiveness of construction,
- understanding and knowledge of construction, maintenance and operation costs (in its lifespan),
- understanding and knowledge of technical regulations and legislation from field of nZEB,
- understanding and knowledge of the meaning of a good living enviroment,
- understanding and knowledge of the details in the project documentation,
- understanding and knowledge of EUE (effective use of energy) actions and their impact on primary energy consumption,
- understanding and knowing the possibilities of passive and active RES (renewable energy source) usage, along with affiliated systems
- understanding and knowledge of construction physics of new constructions and adaptations,
- understanding the meaning of quality inside air and hygiene demands in ventilation,
- understanding the meaning of airtightness,
- understanding and knowledge of problems relating to fire safety,
- understanding the meaning of effective communication with clients and knowledge of skills and types of communication
- understanding and knowledge of basic principles and behaviour of the market of products and services connected with construction, renovation and their marketing.

Definition of first module’s goals:

1. Low energy construction, actions of effective energy usage and their influence on primary energy consumption
In this section participants gain basic information about low energy construction sensibilities. They gain an understanding, that the introduction of effective energy and renewable energy sources actions is unavoidable. They participants get to know basic energy sources according to their source and understand what using renewable sources of energy means – from a professional and enviromental standpoint. Participants understand the meaning of low energy construction and constructing nZEB. When carrying out tasks, they encounter various new materials and technologies. If they fail to realise the logic of low energy construction, some processes may seem unnecessary or too complicated, so they might decide to simplify them. It has to be considered that items such as these the system of low energy construction could fail. Almost 40% of total energy is used for buildings. Effective energy usage actions are needed to reduce primary energy consumption.

2. An interdisciplinary approach to energy efficient construction (nZEB)

Attendees realise that all elements or devices, that were installed, are there for a reason and have their role in ensuring energy efficiency. They must know that while carrying out their tasks, they cannot interfere with products or procedures of others and must perform their part in such a way, that enables other workers to continue their work too. A building is a complex whole that has to offer, besides a quality living enviroment and energy efficiency, at least some basic demands: mechanic resilience and stability, fire safety, hygiene, safe usage and noise protection. To fulfill these demands an interdisciplinary approach is required when discussing the building and the enviroment it which it is set. Only a building that is well planned, constructed and set in its space can be effectively used.

3. Construction, maintenance and operating costs

Participants realise that energy efficient construction is also cost efficient in all construction phases and usage of the building. Only a cost efficient construction can be also energy efficient. This is why an understanding and optimising construction, maintenance, usage and disassembly costs when planning to build is needed.

4. Technical regulations and legislations from the field of energy efficient construction with details in project documentations

Participants are acquainted with existing regulations that shape energy efficient building construction and their usage of renewable energy sources in Slovenia and in the EU. They realise that regulations for individual fields of efficient energy usage and renewable sources of energy exist. This way they will know them in practice and be able to search for them. They are acquainted with project documentation and the most frequent details, which they encounter at work.

5. Principles of a thermal comfort enviroment

Participants are reminded that the building offers a home or work enviroment, protection from weather influences and safety. Staying in the building must enable more than just core human needs; it must also be safe, healthy, comfortable, all in all - quality living. Living conditions in buildings change with time. They develop and follow the state of technology for ensuring medical, biological, psychological, physiological, sociological, ecological, economical and other needs. The goal of low energy construction is to ensure a comfortable living enviroment as well as ensuring functionality in living and business buildings. Every building must be energy efficient, but not at the expense of quality living or functionality.

6. Use of passive and active renewable energy sources
Participants are acquainted with renewable energy options. They realise that we can rely mostly on renewable energy sources according to natural resources. Directly from the sun and indirectly from tidal and wind power as well as biomass and other. They will know that it will be necessary to adapt to renewable energy sources shortly, since our need and their availability are not always synchronised. Sun radiation is least available when we most need heat; wind energy is neither stable nor predictable; water currents still have season changes despite good retaining ability; and there is not enough biomass to provide for the energy consumption of buildings. That is why we have to use all possible ways of acquiring energy in the winter; direct sun radiation for heat, sunlight for lighting, sun radiation for converting into heat or electric energy, and so forth. Summertime is similar, when we need to prevent overheating of living quarters with shading, ventilating at night or with passive cooling.

7. Construction physics and their impact on new constructions and adaptations

Participants realise that construction physics that is based on laws of physics giving us important physical quantities and suggesting corrective action that ensures an individual's functionality and living in buildings, built according to standard, is actually favourable. This means that project architectural solutions have to be suggested. Technology of materials used and construction has to be implemented so that standard demands are fulfilled in term of design, construction and functionality, especially with adaptations when a large part of the existing building is used. Users do neither think of the consequences of individual actions, nor do they take warnings seriously. Not changing to mechanic ventilation after switching from non-airtight to airtight windows is a classic case. The goal of calculating construction physics of individual actions is also explaining the impact these actions on quality living and functionality of the building.

8. Ensuring inside air quality and hygiene demands of ventilation in accordance with the need for airtightness

Participants get to know how substantial energy losses can result from non-airtight buildings. They realise the importance of making buildings airtight for achieving energy efficiency – buildings that are not tight are also not energy efficient. At the same time the quality of air constantly drops because of user activity and equipment or the construction itself. Air needs to be changed so that we can achieve good quality of air with efficient energy usage and minimalising energy losses.

9. Ensuring fire safety

Participants learn one of the basic building demands – fire safety. They know that new technologies and materials can affect fire safety of buildings. Planning appropriate materials and technologies can prevent the risk of fire. Even though energy efficient buildings with built-in flammable materials and devices for conversion or storing energy, exist, they are much more exposed to fire hazards than non-energy efficient buildings. They learn the impact of careful selection and installation of isolation materials, among which many are flammable. All systems are fire-proof only if they are correctly planned, executed and maintained. Lightning-induced fires requires particular attention, too.

10. Participants understand the meaning of effective communication with clients and know skills for successful communicating

Participants gain knowledge and skills that enable them to be direct at dealing with clients and recognising their demands. Using communicating skills correctly, they will establish good contact with the client and will be a position to present products and services effectively, clearly and understandably. Since the work of the participants is usually very
stressful, they will gain knowledge and skills of successful work and communicating in stressful conditions.

11. Participants know and understand the behaviour of the market of products, constructions and their maintenance

Participants learn basic characteristics and tools of marketing, and deepen their knowledge and understanding of products and services as market products. They gain knowledge and understanding of basic methods and tools of marketing communication, also personal/direct promotions and selling products/services. They learn basic marketing way of thinking (marketing philosophy) and the functioning of a company on the market. They also learn to connect and use basic knowledge of products, services and general marketing in a specific field of construction as well as renovation of nZEB.